GODDARD SPACE FLIGHT CENTER

Test Lab Report Summary

Report Number:	Q10164	*Project:*	SWIFT
Part Type:	Microcircuit	*System:*	BAT
Part Number:	OP290GS	*Initiated Date:*	05/01/2001
Date Code:	9739/7P36563.2	*Report Date:*	06/21/2001
Manufacturer:	Analog Devices	*Investigator:*	C. Greenwell (562)
Generic Number:	OP290	*Requester:*	B. Meinhold (562)
Purchase Spec:	Commercial	*Approval / Date:*	

Step 1: INCOMING INSPECTION

Test	Quantity	Passed	Failed
External Visual	N/A	N/A	N/A
PIND Condition A	N/A	N/A	N/A

Step 2: DESTRUCTIVE PHYSICAL ANALYSIS

Destructive Physical Analysis (DPA) was conducted per GSFC document “Plastic Encapsulated Microcircuit (PEM) Guidelines for Screening and Qualification for Space Applications”, except that cross-section was done without dye penetrant and glassivation integrity testing was not performed.

No rejectable defects or anomalies were observed during this analysis.

GODDARD SPACE FLIGHT CENTER

Part Type: Microcircuit Part No: OP290GS
Manufacturer: Analog Devices Date Code: 9739/7P36563.2

Summary of Analysis:

Serial Number	I6	M7	M9	M11	N9
External Examination					
1. Markings - legibility and correctness	A	A	A	A	A
2. Integrity of package seals	N/A	N/A	N/A	N/A	N/A
3. Condition of external leads and plating	A	A	A	A	A
4. Overall package condition	A	A	A	A	A
Radiographic Examination					
5. Die bonding material and die alignment	A	A	A	A	A
6. Package seal integrity	N/A	N/A	N/A	N/A	N/A
7. Presence of foreign material	A	A	A	A	A
8. Lead dress (if revealed)	A	A	A	A	A
Acoustic Microscopy Inspection					
9. Condition of material interfaces (delaminations)	A	A	A	A	A
10. Condition of molding material (voids, cracks)	A	A	A	A	A
Internal Examination (including cross-section)					
11. Presence of foreign material	A	A	A	A	A
12. Mechanical condition of die	A	A	A	A	A
13. Wire bonds and lead dress	A	A	A	A	A
14. Die bonding material	A	A	A	A	A
15. Condition of die surface	A	A	A	A	A
16. Condition of metallization	A	A	A	A	A
17. SEM Examination	N/P	A	A	A	N/P
Bond Strength					
18. Strength	N/P	A	A	A	N/P
19. Metallization adherence	N/P	A	A	A	N/P
Die Bond Strength					
20. Strength	N/P	N/P	N/P	N/P	N/P

SN's I6 and N9 subjected to cross-sectional examination.

(* = Refer to comments, A = acceptable, U = unacceptable, N/A = not applicable, N/P = not performed)

GODDARD SPACE FLIGHT CENTER

Part Type:	Microcircuit	Part No:	OP290GS
Manufacturer:	Analog Devices	Date Code:	9739/7P36563.2

Appended Photographs:

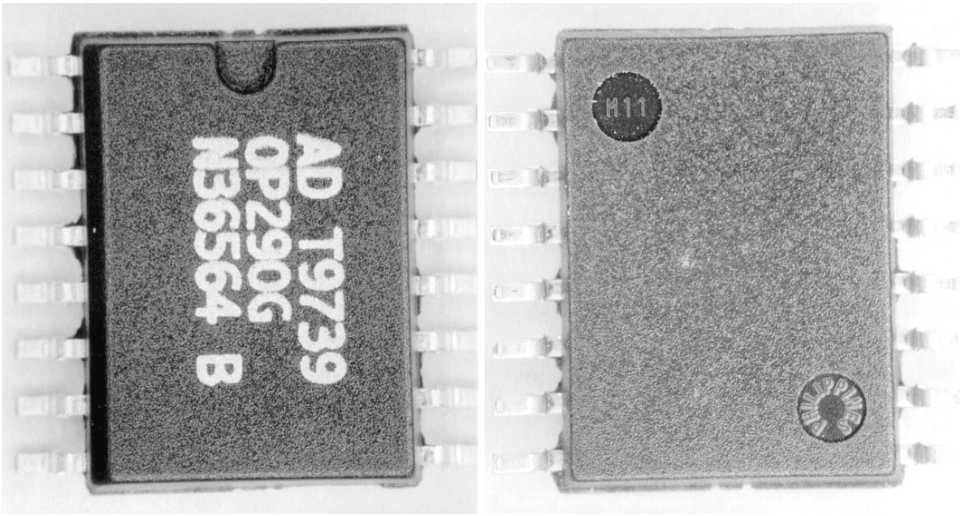

Figure 1. External top and bottom views of the OP290GS devices. Each device had a unique two character alphanumeric code that was used for reference designations during this analysis. 6X

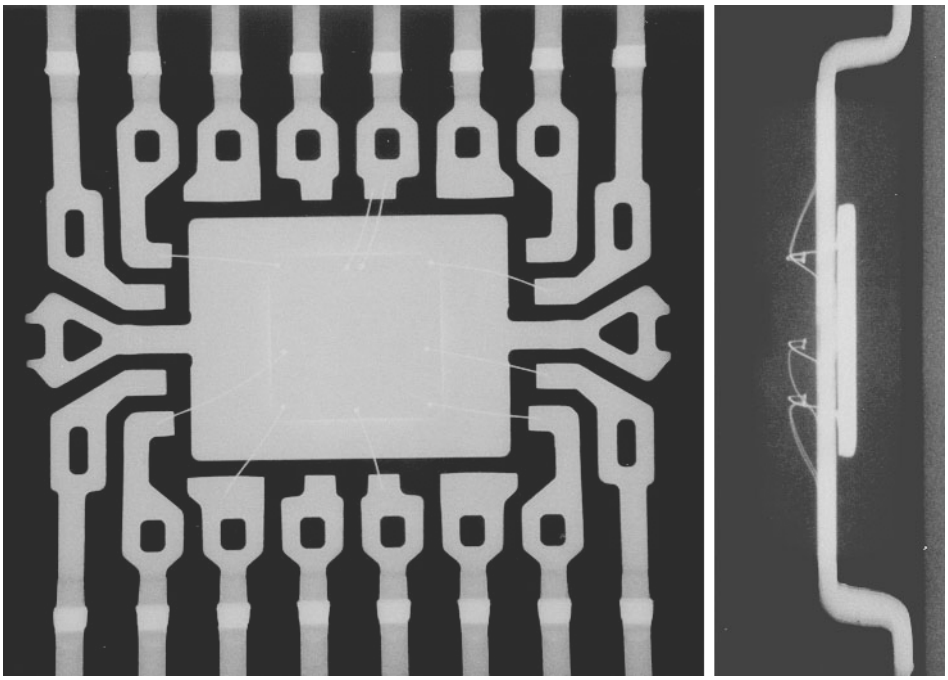

Figure 2. Top and side view radiographic images. 8X

GODDARD SPACE FLIGHT CENTER

Part Type:	Microcircuit	Part No:	OP290GS
Manufacturer:	Analog Devices	Date Code:	9739/7P36563.2

Appended Photographs:

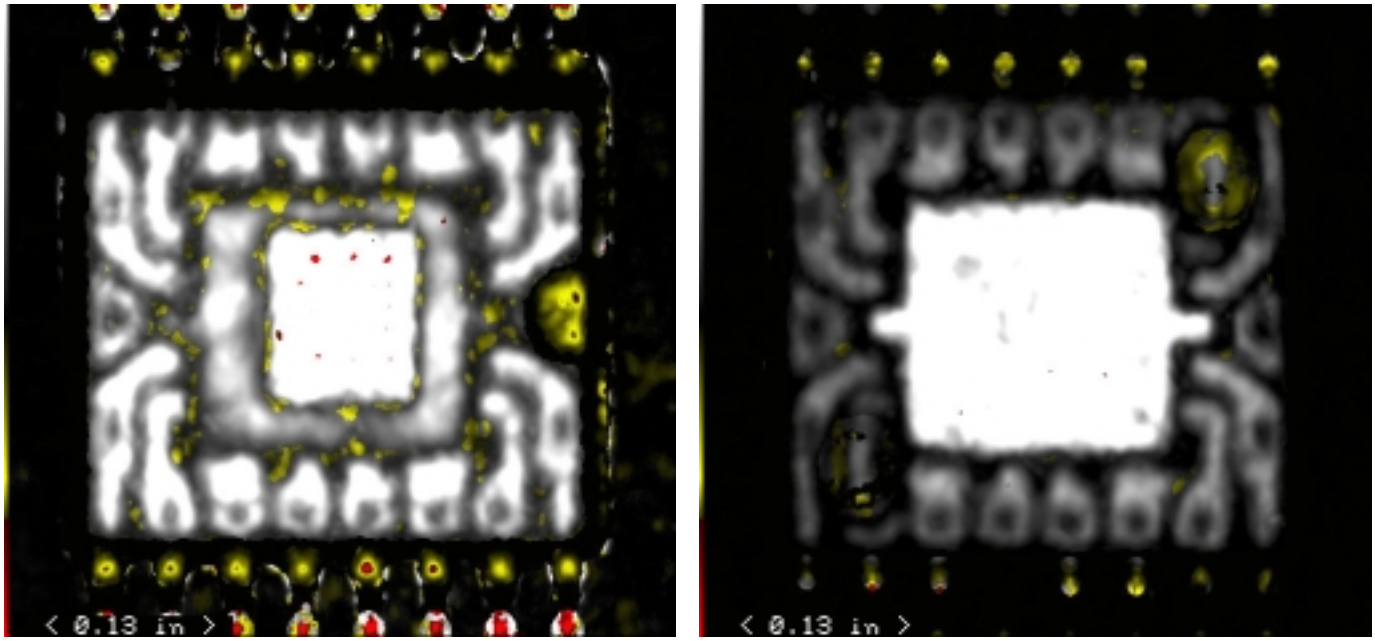

Figure 3. Top (left) and bottom C-SAM images of SN I6.

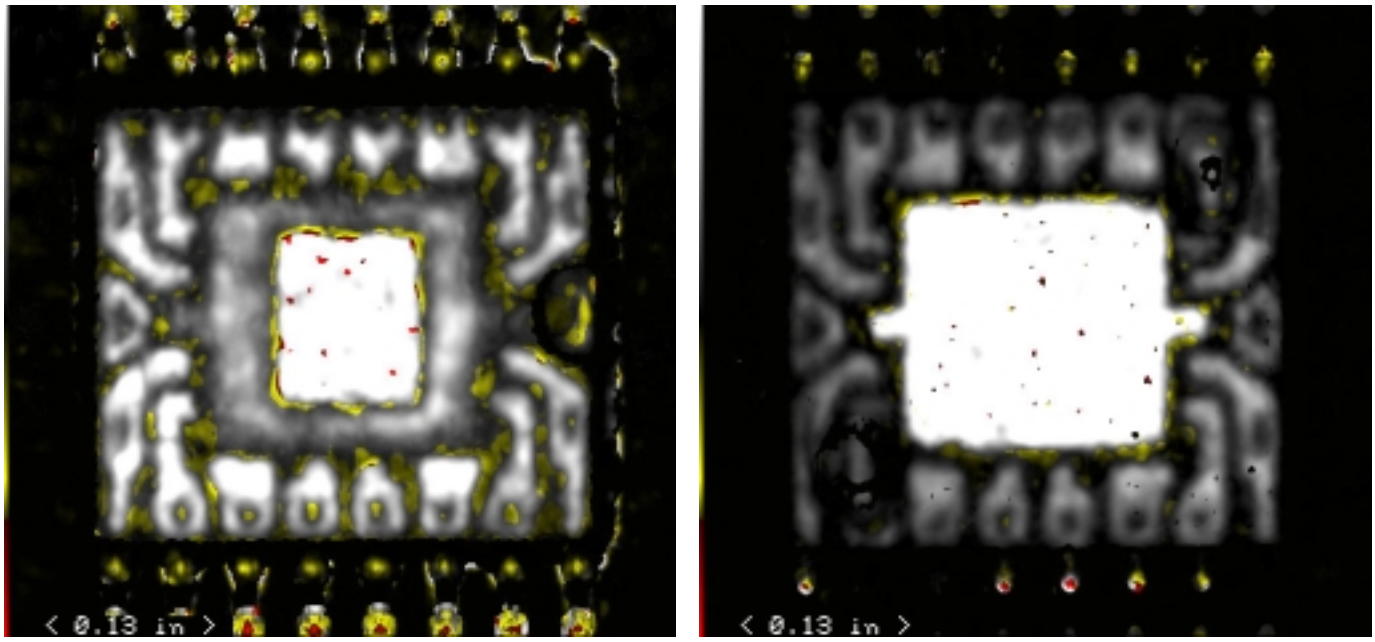

Figure 4. Top (left) and bottom C-SAM images of SN M7.

GODDARD SPACE FLIGHT CENTER

Part Type:	Microcircuit	Part No:	OP290GS
Manufacturer:	Analog Devices	Date Code:	9739/7P36563.2

Appended Photographs:

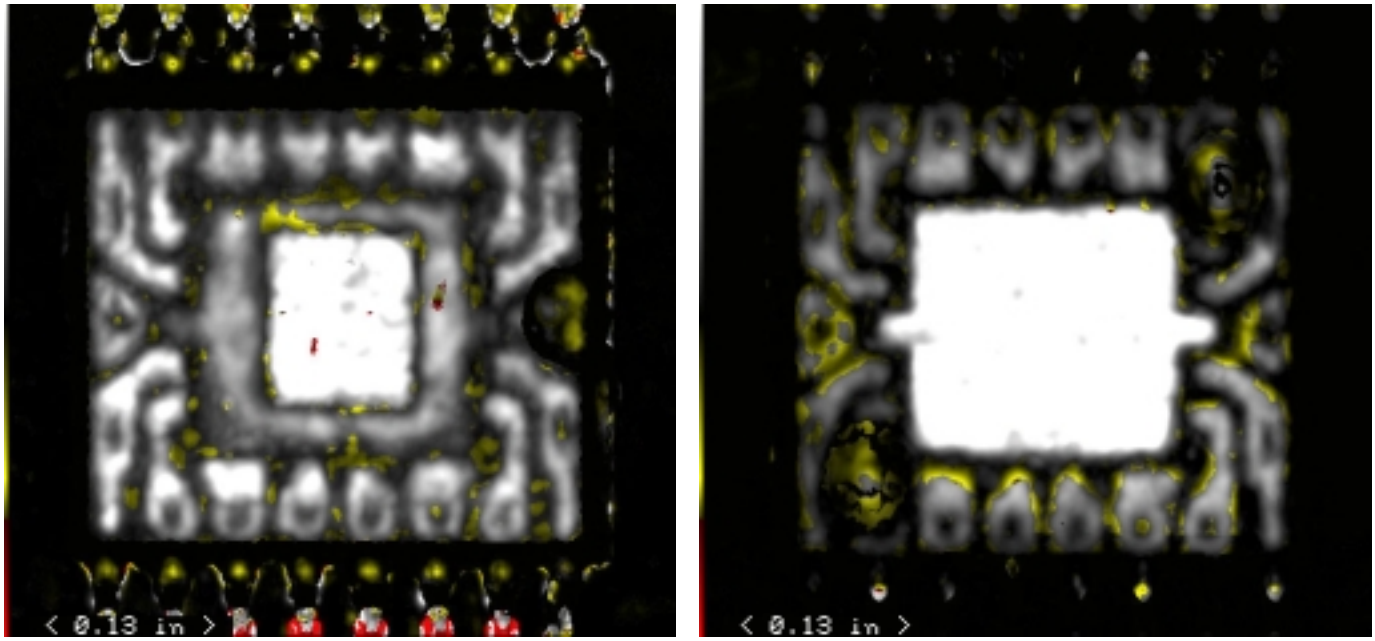

Figure 5. Top (left) and bottom C-SAM images of SN M9.

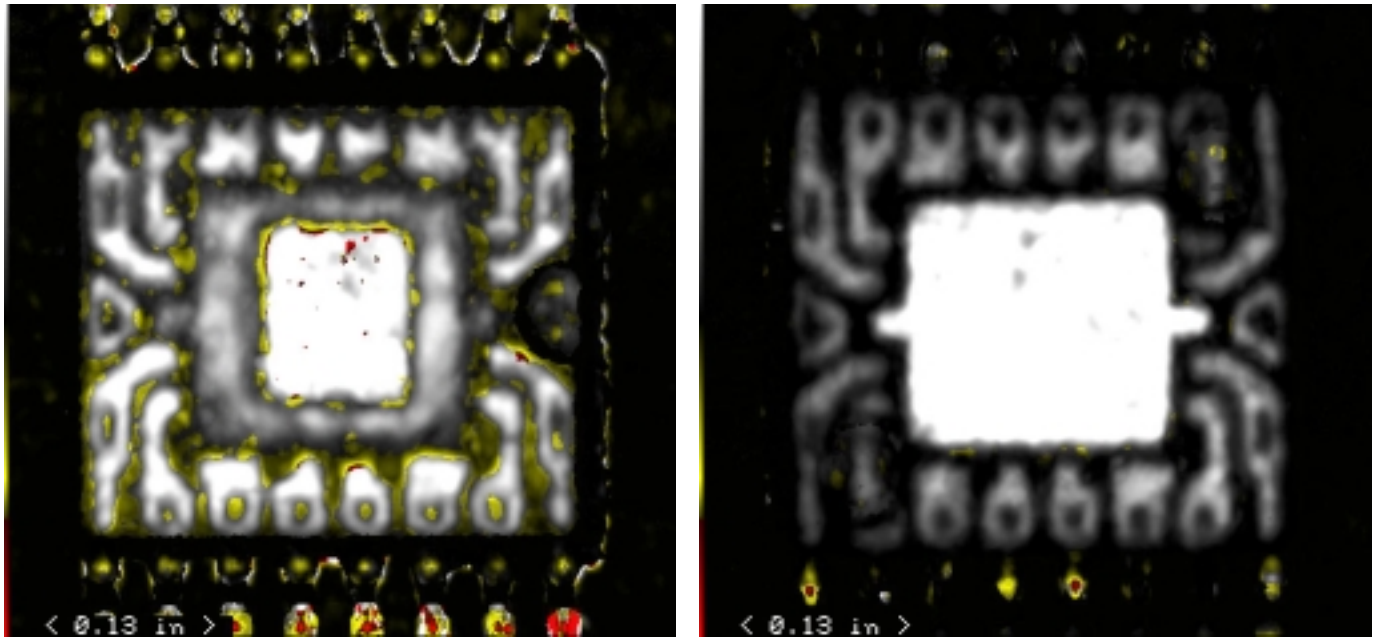

Figure 6. Top (left) and bottom C-SAM images of SN M11.

GODDARD SPACE FLIGHT CENTER

Part Type:	Microcircuit	Part No:	OP290GS
Manufacturer:	Analog Devices	Date Code:	9739/7P36563.2

Appended Photographs:

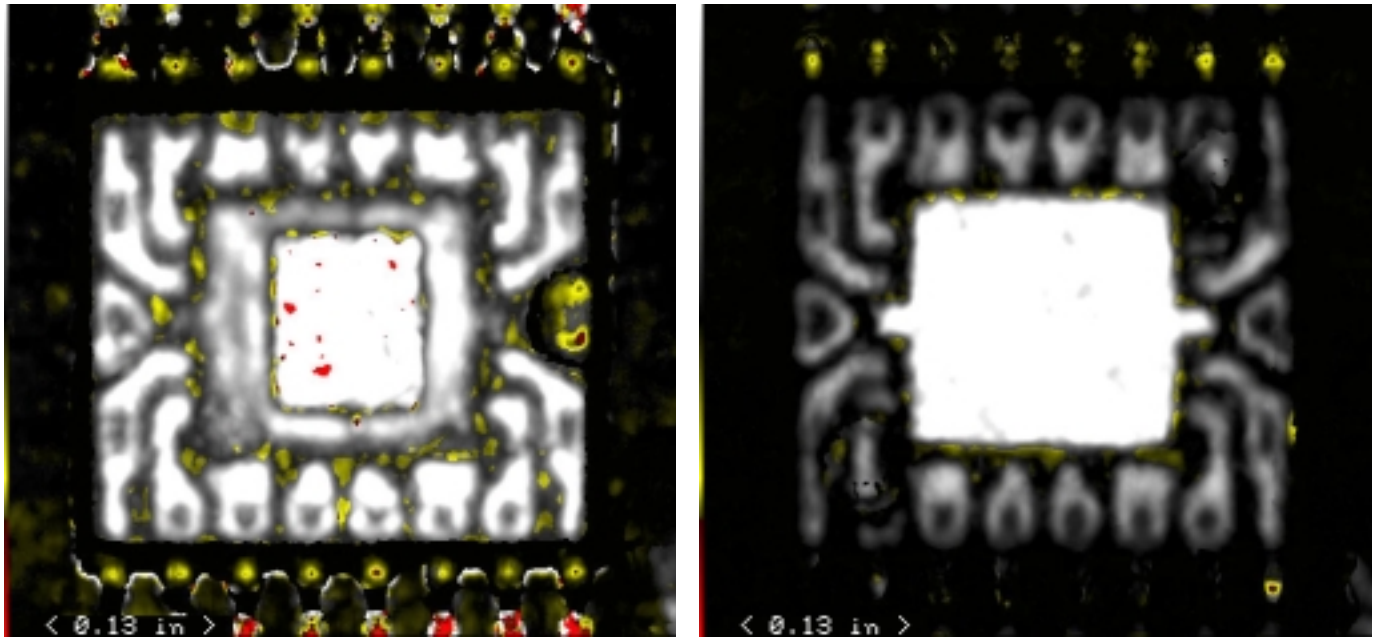

Figure 7. Top (left) and bottom C-SAM images of SN N9.

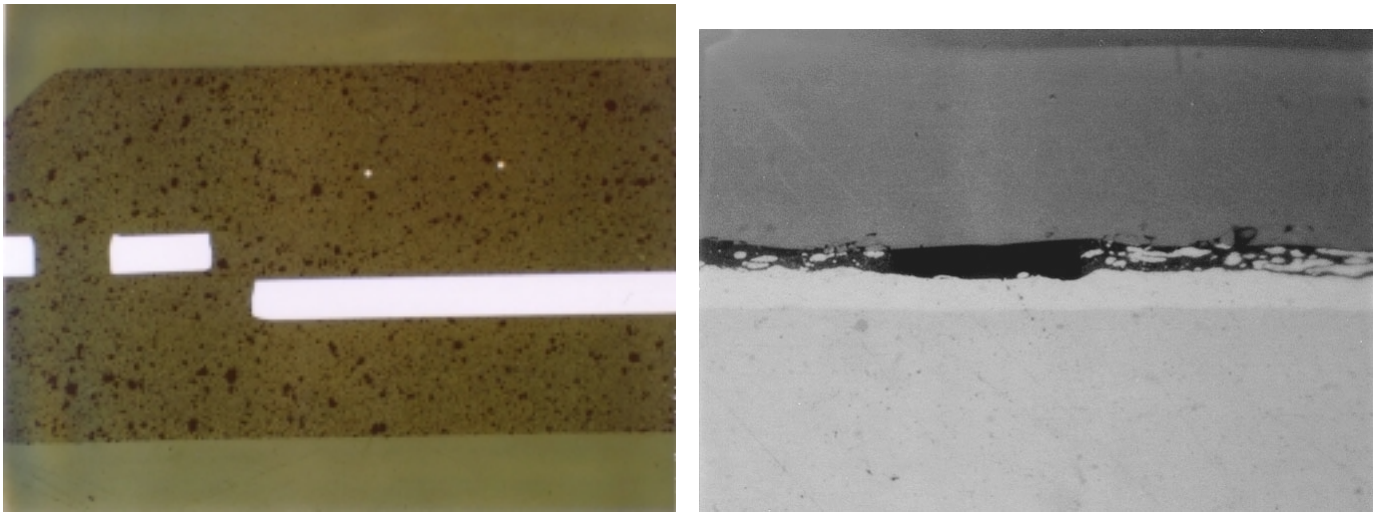

Figure 8. Cross-section images of SN N9. The right side image shows an area of die attach void. The die is on the top side of the image and the plated die paddle is at the bottom. No delaminations or anomalies were observed, consistent with the C-SAM inspection results. Left image ≈ 100X; right ≈ 1000X.

GODDARD SPACE FLIGHT CENTER

Part Type:	Microcircuit	Part No:	OP290GS
Manufacturer:	Analog Devices	Date Code:	9739/7P36563.2

Appended Photographs:

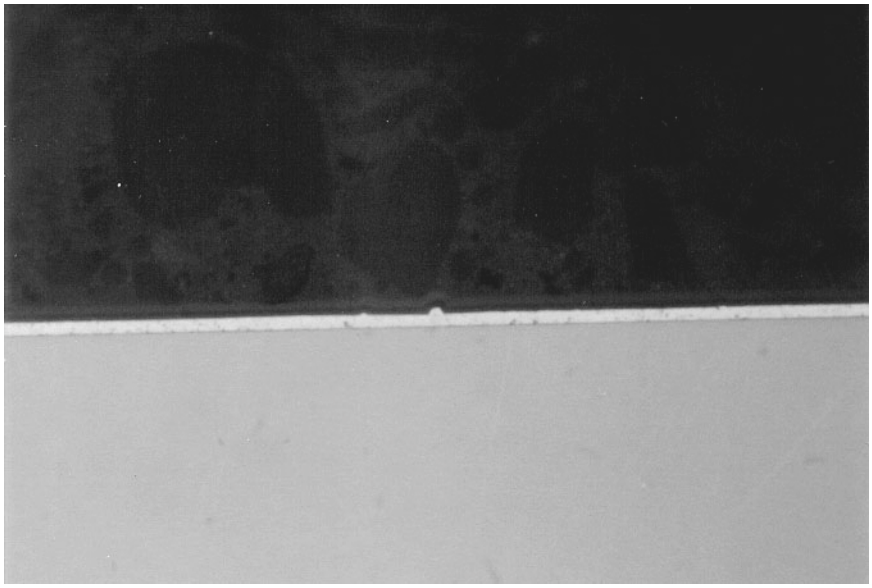

Figure 9. Cross-section images of SN I6. This image shows a hillock formation on the die metallization. No delaminations or anomalies were observed. 1000X.

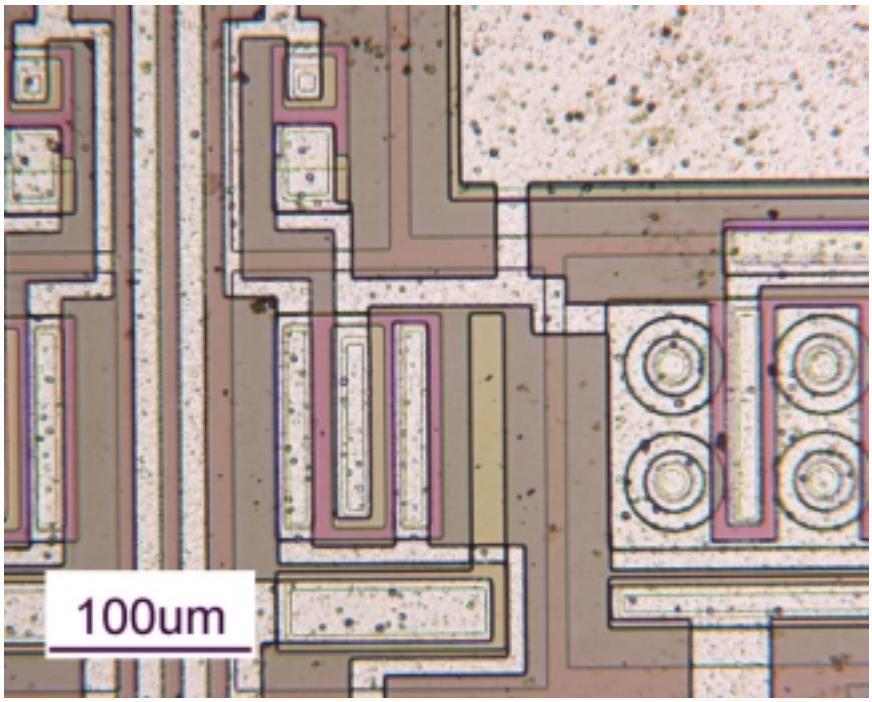

Figure 10. Optical micrograph shows general die features on SN M7. The speckles on the die surface are deprocessing artifact.

Part Type: Microcircuit Part No: OP290GS
Manufacturer: Analog Devices Date Code: 9739/7P36563.2

Appended Photographs:

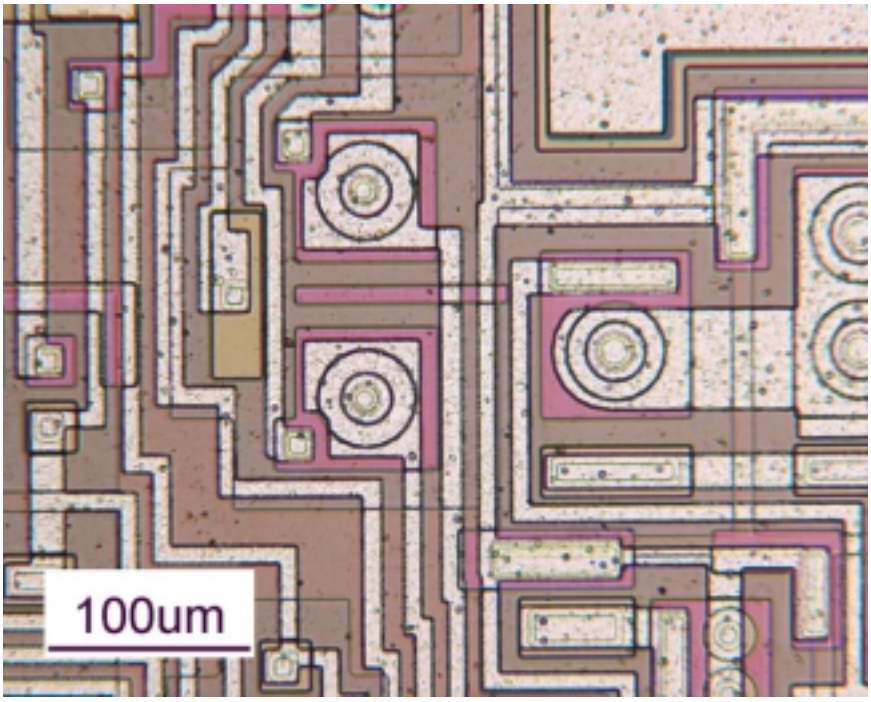

Figure 11. Optical micrograph image of M9 shows general die features.

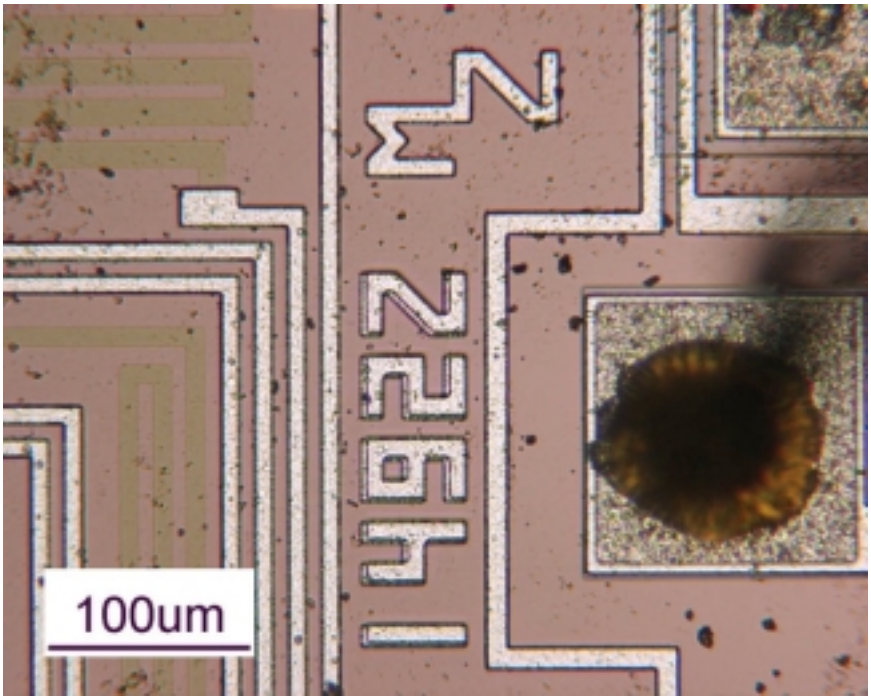

Figure 12. Optical micrograph image shows worst case bond placement on SN M11. Discoloration of the bond pad is due to the acid deprocessing

GODDARD SPACE FLIGHT CENTER

Part Type:	Microcircuit	Part No:	OP290GS
Manufacturer:	Analog Devices	Date Code:	9739/7P36563.2

Appended Photographs:

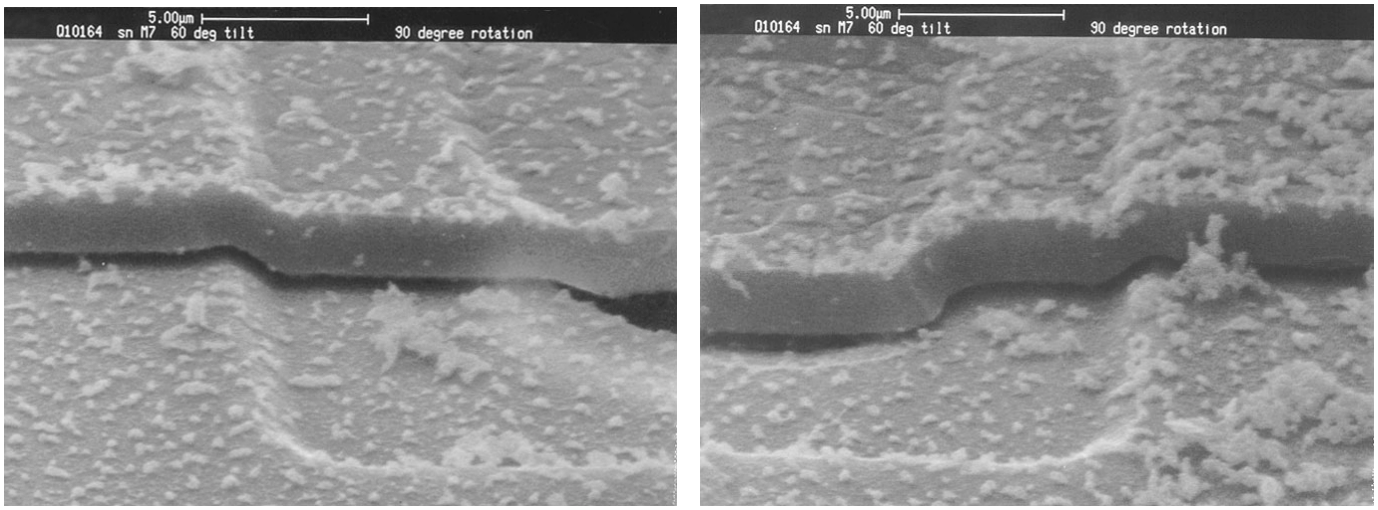

Figure 13. SEM microgaphs of SN M7. The metallization has excellent step coverage. All three DPA samples have etch residue throughout the die surfaces; an artifact of the etch process.

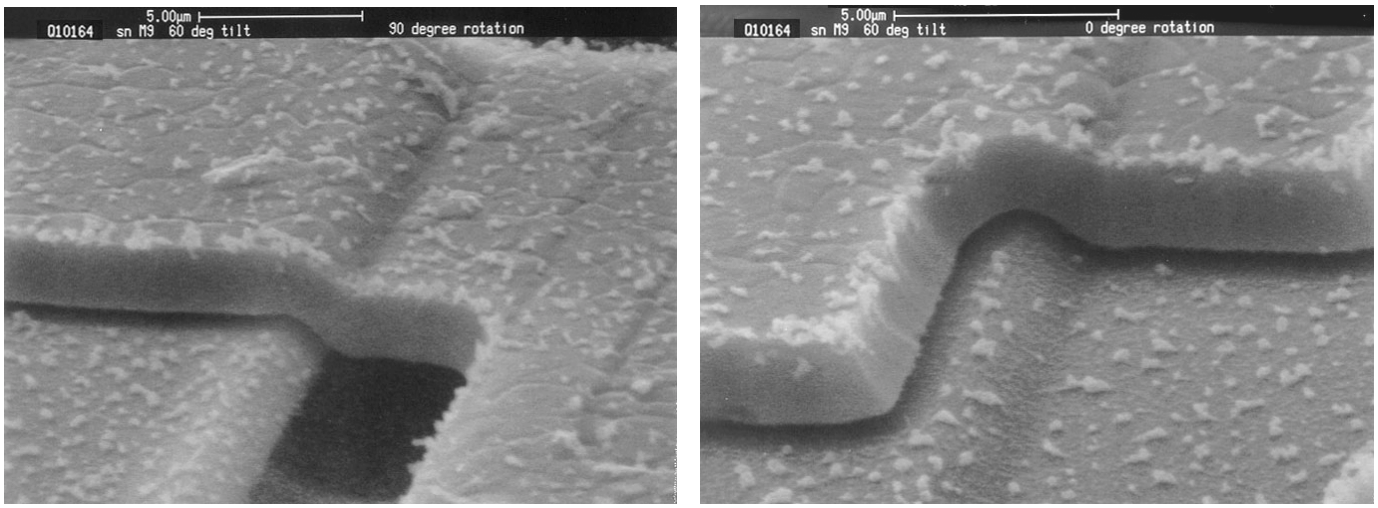

Figure 14. SEM micrographs of SN Q8.

GODDARD SPACE FLIGHT CENTER

Part Type:	Microcircuit	Part No:	OP290GS
Manufacturer:	Analog Devices	Date Code:	9739/7P36563.2

Appended Photographs:

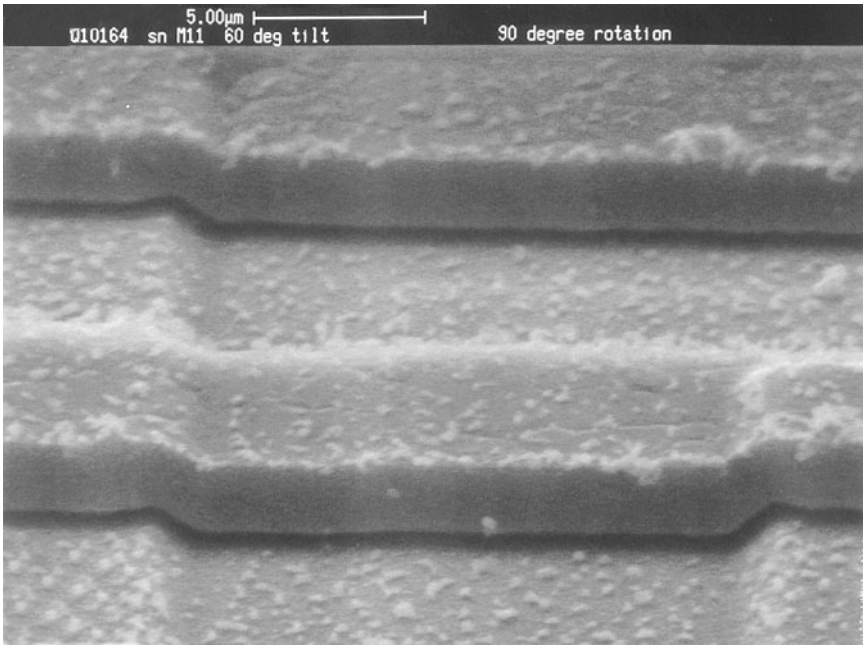

Figure 15. SEM micrograph of SN M11.

Figure 16. SEM micrographs of SN M11.